LDLR gene

low density lipoprotein receptor

Normal Function

The *LDLR* gene provides instructions for making a protein called a low-density lipoprotein receptor. This receptor binds to particles called low-density lipoproteins (LDLs), which are the primary carriers of cholesterol in the blood. Cholesterol is a waxy, fat-like substance that is produced in the body and obtained from foods that come from animals.

Low-density lipoprotein receptors sit on the outer surface of many types of cells, where they pick up low-density lipoproteins circulating in the bloodstream and transport them into the cell. Once inside the cell, the low-density lipoprotein is broken down to release cholesterol. The cholesterol is then used by the cell, stored, or removed from the body. After low-density lipoprotein receptors drop off their cargo, they are recycled back to the cell surface to pick up more low-density lipoproteins.

Low-density lipoprotein receptors play a critical role in regulating the amount of cholesterol in the blood. They are particularly abundant in the liver, which is the organ responsible for removing most excess cholesterol from the body. The number of low-density lipoprotein receptors on the surface of liver cells determines how quickly cholesterol (in the form of low-density lipoproteins) is removed from the bloodstream.

Health Conditions Related to Genetic Changes

hypercholesterolemia

Mutations in the *LDLR* gene cause an inherited form of high cholesterol called familial hypercholesterolemia. More than 1,000 mutations have been identified in this gene. Some of these genetic changes reduce the number of low-density lipoprotein receptors produced within cells. Other mutations disrupt the receptor's ability to remove low-density lipoproteins from the blood. As a result, people with mutations in the *LDLR* gene have very high blood cholesterol levels. As the excess cholesterol circulates through the bloodstream, it is deposited abnormally in tissues such as the skin, tendons, and arteries that supply blood to the heart (coronary arteries). A buildup of cholesterol in the walls of coronary arteries greatly increases a person's risk of having a heart attack.

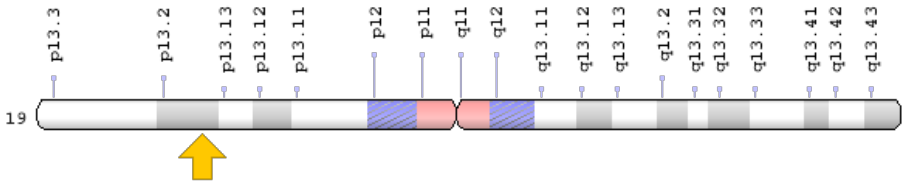
Most people with familial hypercholesterolemia inherit one altered copy of the *LDLR* gene from an affected parent and one normal copy of the gene from the other parent. These cases are associated with an increased risk of early heart disease, typically beginning in a person's forties or fifties. Rarely, a person with

familial hypercholesterolemia is born with two mutated copies of the *LDLR* gene. This situation occurs when the person has two affected parents, each of whom passes on one altered copy of the gene. The presence of two *LDLR* mutations results in a more severe form of hypercholesterolemia that usually appears in childhood.

Chromosomal Location

Cytogenetic Location: 19p13.2, which is the short (p) arm of chromosome 19 at position 13.2

Molecular Location: base pairs 11,089,362 to 11,133,830 on chromosome 19 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- FHC
- LDL receptor
- LDLCQ2
- LDLR_HUMAN
- Low density lipoprotein (LDL) receptor
- low density lipoprotein receptor (familial hypercholesterolemia)

Additional Information & Resources

Educational Resources

- Molecular Biology of the Cell (fourth edition, 2002): The receptor-mediated endocytosis of LDL
  https://www.ncbi.nlm.nih.gov/books/NBK26870/?rendertype=figure&id=A2398
- Molecular Cell Biology (fourth edition, 2000): The LDL Receptor Binds and Internalizes Cholesterol-Containing Particles
  https://www.ncbi.nlm.nih.gov/books/NBK21639/#A4864

GeneReviews

- Familial Hypercholesterolemia
  https://www.ncbi.nlm.nih.gov/books/NBK174884

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28LDLR%5BTI%5D%29+OR+%28low+density+lipoprotein+receptor%5BTI%5D%29+OR+%28LDL+receptor%5BTI%5D%29%29+NOT+%28low+density+lipoprotein+receptor+related%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+360+days%22%5Bdp%5D

OMIM

- LOW DENSITY LIPOPROTEIN RECEPTOR
  http://omim.org/entry/606945

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_LDLR.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=LDLR%5Bgene%5D
- HGNC Gene Family: Low density lipoprotein receptors
  http://www.genenames.org/cgi-bin/genefamilies/set/634
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=6547
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/3949
- UniProt
  http://www.uniprot.org/uniprot/P01130

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